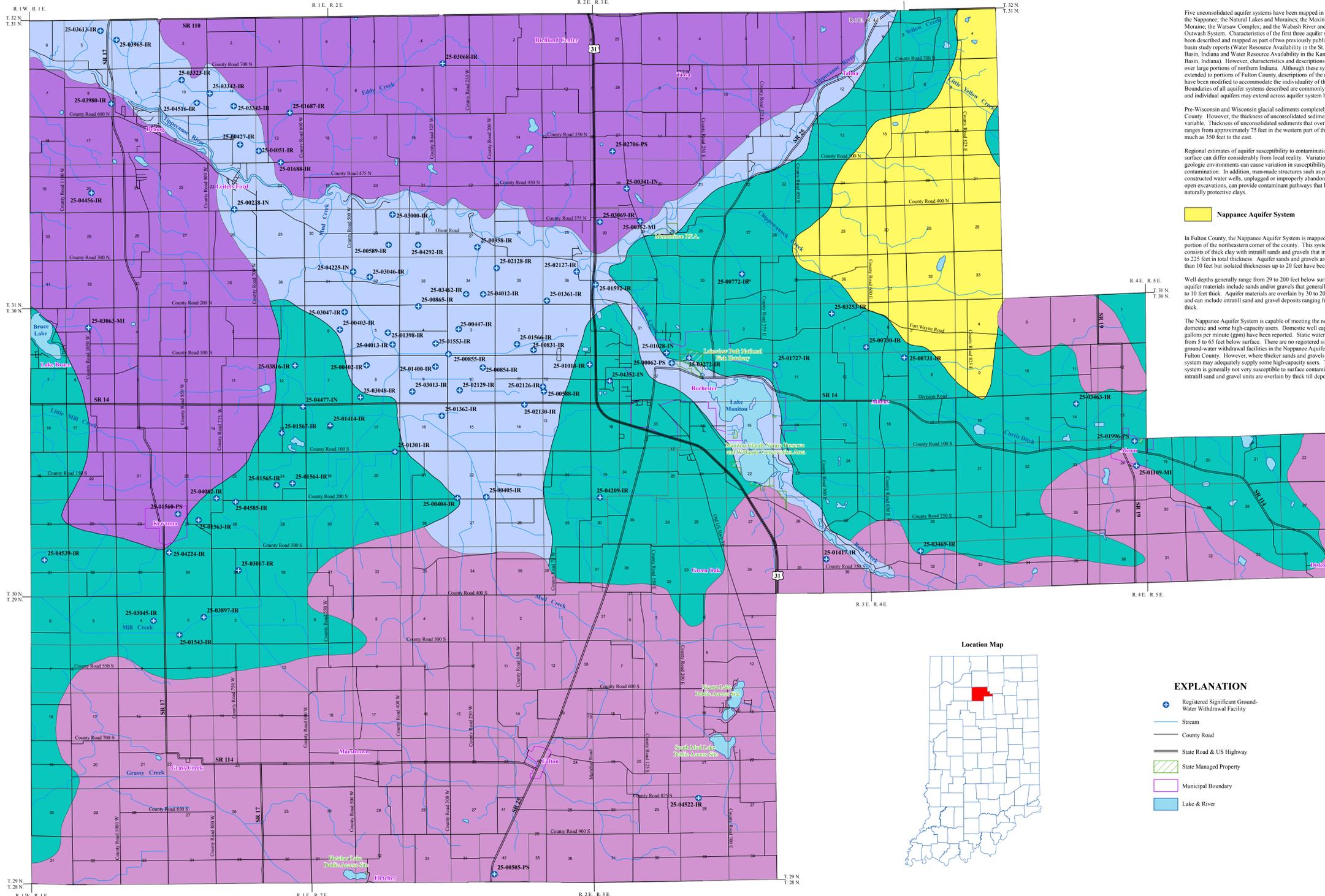


UNCONSOLIDATED AQUIFER SYSTEMS OF FULTON COUNTY, INDIANA



Five unconsolidated aquifer systems have been mapped in Fulton County: the Nappanee, the Natural Lakes and Moraines, the Maxinkuckee Moraine, the Warsaw Complex, and the Wabash River and Tributaries Outwash System. Characteristics of the first three aquifer systems have been described and mapped as part of two previously published regional basin study reports (Water Resource Availability in the St. Joseph River Basin, Indiana and Water Resource Availability in the Kankakee River Basin, Indiana). However, characteristics and descriptions are generalized over large portions of northern Indiana. Although these systems are extended to portions of Fulton County, descriptions of the aquifer systems have been modified to accommodate the individuality of the county. Boundaries of all aquifer systems described are commonly gradational, and individual aquifers may extend across aquifer system boundaries.

Pre-Wisconsin and Wisconsin glacial sediments completely cover Fulton County. However, the thickness of unconsolidated sediments is quite variable. Thickness of unconsolidated sediments that overlie bedrock ranges from approximately 75 feet in the western part of the county to as much as 350 feet to the east.

Regional estimates of aquifer susceptibility to contamination from the surface can differ considerably from local reality. Variations within geologic environments can cause variation in susceptibility to surface contamination. In addition, man-made structures such as poorly constructed water wells, unplugged or improperly abandoned wells, and open excavations, can provide contaminant pathways that bypass the naturally protective clays.

Nappanee Aquifer System

In Fulton County, the Nappanee Aquifer System is mapped along a portion of the northeastern corner of the county. This system typically consists of thick clay with intratill sands and gravels that in places are up to 225 feet in total thickness. Aquifer sands and gravels are generally less than 10 feet but isolated thicknesses up to 20 feet have been reported.

Well depths generally range from 29 to 200 feet below surface. Potential aquifer materials include sands and gravels that generally range from 2 to 10 feet thick. Aquifer materials are overlain by 30 to 200 feet of clay and can include intratill sand and gravel deposits ranging from 3 to 9 feet thick.

The Nappanee Aquifer System is capable of meeting the needs of domestic and some high-capacity users. Domestic well capacities up to 60 gallons per minute (gpm) have been reported. Static water levels range from 5 to 65 feet below surface. There are no registered significant ground-water withdrawal facilities in the Nappanee Aquifer System in Fulton County. However, where thicker sands and gravels are present, the system may adequately supply some high-capacity users. This aquifer system is generally not very susceptible to surface contamination because intratill sand and gravel units are overlain by thick till deposits.

Natural Lakes and Moraines Aquifer System

The Natural Lakes and Moraines Aquifer System in Fulton County is an extension of a broad regional aquifer system initially described in the published report, Water Resource Availability in the St. Joseph River Basin, Indiana. The system in Fulton County is mapped as an apparent transition from the Bluffton Till Aquifer System, mapped further south in Miami and Wabash counties, to the Warsaw Complex Aquifer System in Fulton County.

Unconsolidated deposits overlying bedrock in Fulton County range from 75 to 300 feet thick. Characteristics of this system typically involve thick clay with intratill sands and gravel that overlie the primary aquifer resource. Clay thickness is commonly 50 to 100 feet with the intratill sand and gravels generally less than 15 feet thick.

This system is capable of meeting the needs of domestic and some high-capacity users. Wells completed in the Natural Lakes and Moraines Aquifer System are typically 60 to 120 feet. Aquifer thickness is typically 5 to 15 feet. Domestic well capacities are commonly 10 to 45 gpm. Static water levels are typically 10 to 35 feet below surface with some flowing wells reported. There are 5 registered significant ground-water withdrawal systems (11 wells) utilizing this system with yields ranging from 250 to 1000 gpm.

This aquifer system is generally not very susceptible to surface contamination because intratill sand and gravel units are overlain by thick till deposits.

Maxinkuckee Moraine Aquifer System

The Maxinkuckee Moraine Aquifer System is mapped mostly north of the Tippecanoe River and along the west-central portion of Fulton County. The system is an extension of a regional aquifer system mapped to the north in Marshall County initially described as part of the Kankakee River Basin Study. Unconsolidated deposits are associated with a large moraine complex with varying characteristics that involve discontinuous and isolated surficial sands and gravels, thick till sequences with discontinuous intratill sands and gravels, and deeper aquifer sands and gravels of varying thickness.

Most wells completed in the Maxinkuckee Moraine Aquifer System utilize the deeper sand and gravel deposits. However, a few wells utilize the shallow sand and gravels. Well depths range from 27 to 245 feet but are commonly 60 to 120 feet. Typical aquifer thickness is from 7 to 30 feet; however, in places aquifer deposits may be thicker.

The Maxinkuckee Moraine Aquifer System is capable of meeting the needs of domestic and high-capacity users. Typical domestic yields range from 10 to 50 gpm with static water levels commonly 15 to 50 feet below surface. There are 12 registered significant ground-water withdrawal facilities (16 wells) with reported yields that range from 120 to 1250 gpm.

This aquifer system is generally not very susceptible to surface contamination because intratill sand and gravel units are overlain by thick till deposits. However, wells that utilize the shallow sands and gravels are at moderate risk to surface contamination.

Warsaw Complex Aquifer System

The Warsaw Complex Aquifer System is mapped in large portions of central Fulton County. Several glacial advances resulted in a complex sequence of multiple, stacked, till and outwash units that are quite variable in position and thickness. Unconsolidated materials are up to 350 feet thick. Characteristics of this system include either surface sands and gravels (commonly not used as an aquifer resource) that overlie a thick till with intratill sands and gravels above a primary aquifer unit, or a thick clay cap with intratill sands and gravels that is underlain by an aquifer unit.

Well depths range from 25 to 235 feet but are commonly 60 to 100 feet. In places the system exhibits multiple sand and gravel deposits above the primary aquifer resource that are also a potential source of ground-water. These discontinuous sand and gravel deposits vary from thin to massive and are typically overlain by a thick till. Total accumulative sand and gravel thickness ranges from 3 to 165 feet but are typically 20 to 55 feet. Individually, the intratill sand and gravels are typically 10 to 30 feet thick and the deeper, more productive aquifer deposits 8 to 40 feet thick.

The Warsaw Complex Aquifer System is capable of meeting the needs of domestic and high-capacity users. Typical domestic yields range from 15 to 55 gpm. Static water levels commonly range from 10 to 30 feet below surface with some flowing wells reported. There are 33 registered significant ground-water withdrawal facilities (42 wells) with reported yields that range from 80 to 2000 gpm.

This aquifer system is not very susceptible to contamination where thick clay deposits overlie aquifer materials. However, in places clay thickness is thin or not present. These areas are at moderate to high risk to surface contamination.

Wabash River and Tributaries Outwash Aquifer System

The Wabash River and Tributaries Outwash Aquifer System is the most prolific aquifer system mapped in Fulton County. The system is made up of thick, glacially-derived outwash deposits along a broad outwash plain in the central part of the county. The system also includes valley train and recent alluvial deposits along Rain Creek to the south, Lake Manitowish southeast of Rochester and the Tippecanoe River floodplain to the north.

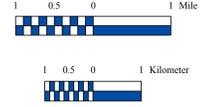
Well depths range from 25 to 156 feet below surface with up to 110 feet of continuous sand and gravel. However, typical well depths are 50 to 85 feet. In places, aquifer materials are capped by silt or sandy clay ranging from 10 to 30 feet thick. In addition, aquifer sand and gravel deposits may include discontinuous clay, sandy clay or gravelly clay deposits 5 to 25 feet thick.

The Wabash River and Tributaries Outwash Aquifer System is capable of meeting the needs of domestic and high-capacity users. Domestic wells are commonly 10 to 60 gpm with static water levels commonly 4 to 20 feet below surface. Some flowing wells are reported. There are 44 registered significant ground-water withdrawal facilities (53 wells) in the outwash system in Fulton County. Well yields range from 80 to 2000 gpm.

Areas that lack overlying clay or silt deposits are highly susceptible to contamination. However, where overlying clay or silt deposits are present the system is moderately susceptible to surface contamination.



- EXPLANATION**
- Registered Significant Ground-Water Withdrawal Facility
 - Stream
 - County Road
 - State Road & US Highway
 - State Managed Property
 - Municipal Boundary
 - Lake & River



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This map was created from several existing shapefiles. Township and Range Lines of Indiana (line shapefile, 20020621), Land Survey Lines of Indiana (polygon shapefile, 20020621), and County Boundaries of Indiana (polygon shapefile, 20020621), were all from the Indiana Geological Survey and based on a 1:24,000 scale. Draft road shapefiles, System1 and System2 (line shapefiles, 2003), were from the Indiana Department of Transportation and based on a 1:24,000 scale. Populated Areas in Indiana 2000 (polygon shapefile, 20021000) was from the U.S. Census Bureau and based on a 1:100,000 scale. Streams27 (line shapefile, 20000420) was from the Center for Advanced Applications in GIS at Purdue University. Managed areas 96 (polygon shapefile, various dates) was from IDNR. Unconsolidated aquifer systems coverage (Maier, 2008) was based on a 1:24,000 scale.

Unconsolidated Aquifer Systems of Fulton County, Indiana

by
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